FETC SUCCESS
U.S. Department of Energy
Federal Energy Technology Center

CLEAN AFFORDABLE
FUELS

- [x] fossil energy
- [ ] environmental
- [ ] energy efficiency
- [ ] other

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Low Quality Natural Gas Upgrading

States Impacted:
Arkansas, California, Colorado, New Mexico, Oklahoma, Texas

Benefit Areas:
Cost-Effectiveness, Federal/ State Revenues

Participants:
Gas Research Institute, Institute of Gas Technology, Krupp Wilputte, Inc., Koch Engineering Co., Huntsman Chemicals, Michigan Consolidated Gas Company, BASF, and Shell Western Exploration and Production, Inc.

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Description

New natural gas separation concepts need to be developed that can yield significant efficiency improvements and cost reductions. The Institute of Gas Technology, in partnership with DOE, the Gas Research Institue, Krupp Wilputte, Koch Engineering, Huntsman Chemicals, and Shell Western Exploration, has completed several field tests of a skid-mounted gas processing unit that uses N-Formyl Morpholine (NFM) as a low-cost solvent to treat natural gas containing high levels (greater than 10 percent) of carbon dioxide.

Considerable quantities of low quality natural gas (LQNG) exist in the United States. Approximately 20 percent of gas reserves and current natural gas production falls into this category. In general, utilization of LQNG depends on the separation of hydrocarbon and nonhydrocarbon components, with the degree of separation required depending on the particular use. Non-hydrocarbon components may be marketable, such as hydrogen sulfide for conversion to elemental sulfur.

Goals:

The objective is to demonstrate the technical and economic viability of using a low-cost physical solvent, N-Formyl Morpholine (NFM), in new and retrofitted installations to treat natural gas that contains high concentrations of carbon dioxide.

Tangible Benefits

National: This process is part of a suite of advanced technologies and projects under DOE sponsorship that are helping ensure an adequate supply of domestic natural gas. Compared to current state-of-the-art physical solvent processes, the N-Formyl Morpholine process shows a 40-percent cost savings, based on a 15 percent CO_2 gas composition at a capacity of 100 million standard cubic feet per day (MMscf/d). The savings are expected to be even higher with higher acid-gas concentrations. These predictions were based on laboratory and bench-scale experiments and process modeling using a commercial process-simulation computer program. Additional benefits of this technology are: (1) low capital investment — smaller equipment, carbon steel construction, and fewer pieces of rotating equipment, fewer vessels; (2) higher product yield — less loss of C_1 - C_6 hydrocarbons and higher Btu recovery; (3) high hydrogen sulfide/carbon dioxide loading — resulting in lower solvent circulation and no refrigeration; (4) environment compatibility — low emissions, biologically degradable, and no hazardous emissions; (5) a chemically and thermally stable solvent — low solvent losses with low unit cost, safe and non-toxic; and (6) operational simplicity — resistant and forgiving to process upsets and simple control.

Regional: The field testing is currently taking place at the Fandango treating plant of Shell Western Exploration and Production in South Texas. The technology is particularly useful for small independent producers with gas processing plants.

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